159 - OVERWEIGHT AND OBESITY PREVALENCE AMONG STUDENTS FROM THE CENTRAL REGION OF THE STATE OF RIO GRANDE DO SUL

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Introduction

Obesity is an epidemic defined by the World Health Organization as a disease characterized by the excessive body fat accumulation as a result of a positive energetic balance that may generate health damages. The concern with health promotion and with obesity indexes has constituted priority of studies and the aim of identifying the risk factors of this disease has drawn special attention (Grillo *et al*., 2005; Abrantes *et al*., 2002; Mondini and Monteiro, 1998).

The overweight and obesity prevalence has increased significantly in developed countries and in countries under development as well. In 20 years, this prevalence increased around 10% in countries such as the United States and Brazil; however, in China, this increase was of 1.3% in 6 years (Wang *et al,*2002). The obesity prevalence among children and adolescents causes special concern due to the increased risk that these individuals present of becoming obese adults. An obese child has around 40% of chances of becoming an obese adult, and this chance is of 75% for an obese adolescent. This is verified because weight gains above the expected values during childhood and adolescence lead to an irreversible increase on the number of fat cells (Curvelo, 2006).

Several reasons have been pointed for the appearance and maintenance of obesity in a number of populations (Mendonça and Anjos, 2004; Kumanyika, 2001; Gigante *et al*., 1997). Among these, the two most reported reasons associated with a positive energetic balance condition are changes on the food consumption generated by an increased dietary energy intake and reduction on the physical activity levels (Kumanyika, 2001), thus reducing the physical fitness among children and young individuals.

The concept of physical fitness adopted here is the ability of performing daily tasks without fatiguing and the presence of wide energy stores for entertainment purposes and emergency necessities (Patê, 1995; Mathews, 1980). The concept regarding physical fitness is that a better index for each one of its components is associated to lower risks of developing diseases and/or functional disabilities (ACSM, 2003).

The Health-Related Physical Fitness (HRPF) was used from the moment in which the dichotomy between athletic performance and health promotion became more evident. This includes morphological, motor-functional, physiological and behavioral dimensions. The morphological dimension gathers components related with composition and distribution of the body fat that present some relation with a better health status. The motor-functional dimension, in turn, involves the cardiorespiratory function (VO_2max) and the muscle-skeletal function (Guedes and Guedes, 1995, Matsudo and Matsudo, 2000).

In this context, the present study proposes investigating the overweight and obesity prevalence in students and analyzing possible associations between the HRPF scores and overweight/obesity.

Methodology

The sample was composed of 1423 students (770 boys and 653 girls) with ages ranging from 7 to 17 years belonging to schools of three cities at the central region of the state of Rio Grande do Sul interested in participating of the Brazil Sports Project (PROESP-RS) in the year of 2003. After being aware of the project, the schools contacted the representatives of the project in that region and scheduled dates for the data collection.

The definition of overweight and obesity of the present study followed recommendations proposed by Cole *et al* (2000), which use values of 25 and 30 kg/m², respectively, adapted according to age and gender. The methodology selected this classification because it uses data from different countries: Brazil, Great Britain, Hong Kong, Netherlands, Singapore and the United States and presents cut values for children and adolescents (Cole *et al*, 2000).

The students were grouped into age ranges of current use in the medical literature: school age (7-9 years), early adolescence (10-14 years) and intermediate adolescence (15-17 years) (Ferreira *et al*, 1998).

The following HRPF measures and protocols were used for this classification: BMI (Cole *et al*, 2000), Aerobic Resistance Test (9-minute test) (AAHPERD, 1980), Flexibility - Mobility Test (Seat and reach test in Wells bench) and Abdominal Resistance Test (Fitnessgram, 2002).

The "t" Student Independent test was used to verify possible differences between genders. Linear regression was used to identify relationships between BMI and age and the Chi-square test to verify differences statistically significant between prevalences and age ranges and possible associations between HRPF and overweight/obesity.

The data were computed in the Excel 2000 program. The SPSS statistical program (Statistical Package for the Social Sciences) version 14.0 was used for the statistical analysis.

Results

The sample descriptive data are presented in Table 01.

Variables	Girls		Boys		Sig
	n	Average ± sd	n	Average ± sd	
Age	653	12.73 ± 2.23	770	13.08 ± 2.21	0.003*
BMI (kg/m²)	627	19.81 ± 3.58	740	20.14 ± 3.76	0.101
Flex (cm)	596	25.09 ± 7.80	697	22.78 ± 7.68	0.000*
Abd (rep)	600	27.92 ± 9.54	707	35.04 ± 11.29	0.000*
9 min (m)	486	1319.57 ± 204.22	630	1609.73 ± 301.75	0.000*

* Difference statistically significant p<0.05 ("t" Student test)

The distribution of students in relation to gender was of 54.1% of males and 45.9% of females, and differences statistically significant were found between genders for the variables investigated except for BMI.

The behavior of the variable BMI and overweight and obesity prevalences for males and females in function of age are presented in Figures 01, 02 and 03, respectively.

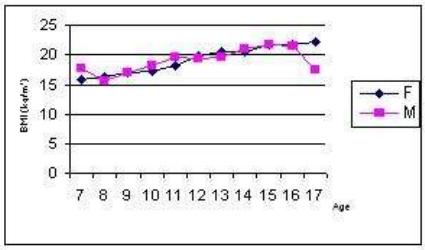
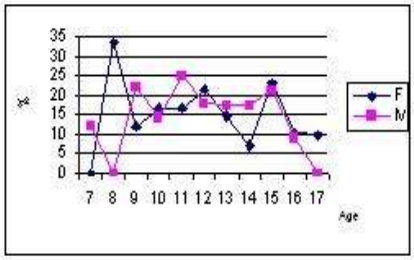


Figure 01. Behavior of the BMI in function of age.



igure 02. Overweight prevalence in function of age

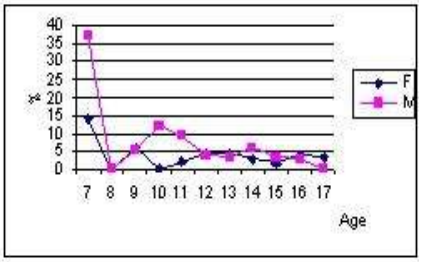


Figure 03. Obesity prevalence in function of age.

Table 02 presents overweight and obesity prevalences found in function of the different age ranges.

	n	Overweight (%)		Obesity (%)	
		F	M	F	M
School age (7 – 9 years)	77	12.5	13.5	7,5	10,8
Early adolescence (10 – 14 years)	961	15.7	18.9	3,1	6,0
Interm. adolescence (15 – 17 years)	291	15.7	15.9	2,9	3,3
Total	1329	15.5	17.9	3,3	5,7
General	1329	16.8 (14.8 – 18.8)*		4.6 (3.6 – 5.9)*	

* Confidence Interval (95%)

One observes through Figure 01 that there is a trend for BMI values to increase in function of age. This fact is corroborated through linear regression, where a value for "F" (149.42 and 71.36 for girls and boys, respectively) significant for $p<0.05$ was found, for both genders. The equations proposed for the regression line are presented as follows: Female: BMI=10.8994 + 0.702055 (age) (R^2 = 192%), and male: BMI=12.6520 + 0.577616 (age) (R^2 = 9.1%). One may then infer that age explains the BMI values for girls and boys in 19.2% and 9.1%, respectively.

One also observes through Figures 02 and 03 and Table 02 that boys presented higher prevalences both for overweight and obesity when compared to girls. Significant differences were found between prevalences of both genders ($p<0.05$), emphasizing the age range of 8-11 years for overweight ($p<0.05$) (Figure 02).

Extreme incidences (from 0 to 37.5%) of overweight and obesity in children with 7-8 years of age also stand out. This fact may be explained by the small sample size (22 and 20 individuals, respectively). Excluding this age range, it is possible identifying that boys presented higher prevalences at the ages of 9 and 11 years and girls at ages of 12, 13 and 16 years (Figures 02 and 03).

Table 03 presents associations between overweight/obesity and scores obtained in health tests.

		Female		Male	
Test		Overweight	Obese	Overweight	Obese
9 minutes*	Below	35.4% (35)	60.0% (12)	36.0% (50)	47.5% (19)
	Healthy	39.4% (39)	15.0% (3)	39.6% (55)	30.0% (12)
	Above	1% (1)	0 (0)	7.9% (11)	0(0)
Flexibility	Below	41.4% (41)	55.0% (11)	25.2% (35)	35.0% (14)
	Healthy	35.4% (35)	25.0% (5)	29.5% (41)	22.5% (9)
	Above	21.2% (21)	20.0% (4)	33.1% (46)	32.5% (13)
Abdominal*	Below	54.5% (54)	60.0% (12)	45.3% (63)	57.5% (23)
	Healthy	22.2% (22)	25.0% (5)	28.1% (39)	15.0% (6)
	Above	17.2% (17)	0 (0)	20.9% (29)	10.0% (4)

* There is an association between overweight/obesity and the tests (Chi-square test, $p<0.05$).

Associations between scores in variables 9-minute and abdominal were observed, in other words, overweighed/obese children presented trend to reach scores considered below healthy levels for an HRPF.

Discussion of Results

Some local studies on the nutritional condition of students in Brazilian cities have demonstrated obesity prevalence in adolescence ranging from 8 to 22%, depending on the region, data collection period and methodology employed (Lamounier, 2000).

An overweight prevalence of 16.8% (CI 95%= 14.8 to 18.8%) and an obesity prevalence of 4.6% (CI 95%= 3.6 to 5.9%) were verified in our sample. One may consider it as a reliable overweight and obesity estimation, once narrow confidence intervals were found in relation to this prevalence.

The obesity prevalence in childhood and adolescence found in the present study was similar to that of a study performed in Brasilia (5.5%) (Giugliano and Melo, 2004), Pelotas (4.5%) (Dutra *et al*, 2006), and in the northeastern and southeastern regions (4.55%) (Abrantes *et al,* 2003), involving students with ages ranging from 6 to 10 years, 10 to 19 years and 0

to 19 years, respectively. In Florianópolis, Soar *et al* (2006) found a higher prevalence (6.7%) in students with ages ranging from 7 to 9 years.

The overweight prevalence among students found in the central region of the state of Rio Grande do Sul was far higher than that found in the northeastern and southeastern regions (10.35%) (Abrantes *et al*, 2003); similar to Brasilia (14.6%) (Giugliano and Melo, 2004) and lower than those detected in Florianópolis (17.9%) (Soar *et al*, 2004) and Pelotas (21.81%) (Dutra *et al,* 2006). In China, studies reported increases on the overweight and obesity prevalences mainly among adolescents with eleven and twelve years of age (Chunming, 2000). The age range of highest prevalence (overweight and obesity) in this study was of 10-14 years.

Some authors describe higher overweight and obesity prevalence among girls (Abrantes *et al*, 2003; Giugliano and Melo, 2004); however, the opposite is also described (Chunming, 2000, Soar *et al*, 2004, Dutra *et al,* 2006).In the present study, boys presented higher overweight and obesity prevalence in all age ranges, and this difference was statistically significant.

When analyzing the association between overweight/obesity and the HRPF scores, one observes that almost half (50%) of individuals with changed BMI present HRPF scores below values recommended for 9-minute and abdominal tests, where association between scores was verified according to the Chi-square test, with emphasis for the abdominal test that presented prevalences above 45%. These results cause concern, once the 9-minute test is associated with the cardiorespiratory capacity, and low cardiorespiratory capacity is related to an extremely higher risk of early death due to many causes, especially to cardiovascular diseases (ACSM, 2003).

The localized muscular strength (evaluated through the abdominal test) and flexibility avoid postural and articular problems, muscle-skeletal lesions, osteoporosis, low back pain and localized fatigues (George, Fisher and Vehrs, 1996). However, unsatisfactory results obtained in these tests do not indicate that the individuals have or will have postural problems (Nieman, 1999; ACSM, 2003).

When someone stands, the weak abdominal muscles and the nonflexible column posterior muscles allow the pelvis to move forward, causing a curvature of the lumbar region (called lordosis) (Nieman, 1999). Some authors report that obese children present higher chances of presenting the following postural deviations: scoliosis, increase on the thoracic humpback, lumbar hyperlordosis (Bruschini. & Nery (1995), pelvic anteroversion, valgos knees and flat feet (Bruschini, 1995; Tachdjian, 1998). The subjects of this sample presented results that caused concern in relation to flexibility and localized muscular strength.

Conclusion

In short, the data observed showed that overweight and obesity prevalence among the students investigated is higher for boys when compared with girls. The highest overweight prevalence was observed within the age range of 10-14 years for both genders. The findings of this study demonstrate that the overweight and obesity prevalence is similar to that of other Brazilian regions and cities and corroborate to show that this is a phenomenon that grows throughout the country.

The results also caused concern in relation to the cardiorespiratory and muscular strength components, where most students presented scores below HRPF minimum healthy limits. In this perspective, the sample studied is exposed to postural and articular problems, muscle-skeletal lesions, osteoporosis, low back pain, fatigues and cardiovascular diseases.

Overweight and obesity may be considered as an emerging problem in the studied region. Thus, interventions aimed at changing lifestyles into healthy food habits and the regular practice of physical activities involving multiple contexts that the children are involved with should be encouraged, especially in relation to school and family. The effort of fighting the overweight epidemics during childhood must not come from public policies only, but also from parents and family members of these children and adolescents, who should give the example of a healthy food habit and the regular practice of physical activities, as well as warning them for the risk of spending many hours in front of TV, videogames or computers.

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OVERWEIGHT AND OBESITY PREVALENCE AMONG STUDENTS FROM THE CENTRAL REGION OF THE STATE OF RIO GRANDE DO SUL

Abstract

The objective of this study was to describe the overweight and obesity prevalence among students from the central region of the state of Rio Grande do Sul and to verify possible association between the Body Mass Index (BMI) and the Health-Related Physical Fitness scores (AFRS). 1423 students (54.1% boys and 45.9% girls) with ages ranging from 7 to 17 years from schools of three cities at the inland of the state of Rio Grande do Sul were evaluated. Overweight and obesity were defined based on the BMI equal to or greater than 25 and 30 kg/m², adapted for age and gender according to recommendations from Cole *et al* (2000). The AFRS was evaluated based on the 9-minute, Abdominal and Flexibility tests. For the statistical analysis, the "t" Student test (to verify differences between genders) and the Chi-square test (to verify possible differences between prevalences and association between BMI and the AFRS scores) were applied. Linear regression was used to verify the existence of linear relation between BMI and age. Overweight and obesity prevalences of 16.8% and 4.6% were found, respectively. Boys presented higher prevalences of overweight (17.9% and 15.5%) and obesity (5.7% and 3.3%), respectively, when compared to girls, and this difference was statistically significant ($p<0.05$). The age range of 10 - 14 years presented the highest percentage of overweighed and obese individuals. Linear regression indicated the existence of linear relation between BMI and age. An association between overweight/obesity in the 9-minute and Abdominal tests was found. One may conclude that the overweight and obesity prevalence in the region investigated is higher among boys. The highest overweight prevalence was found at the 10 - 14 age range. Overweighed and obese children presented trend to obtain indexes below recommended values for the AFRS tests.

Keywords: Obesity, Physical Fitness, Health.

PREDOMINANCE DE SURPOID ET OBESITE CHEZ LES ETUDIANTS DE LA REGION CENTRALE DE RIO GRANDE DO SUL

Resumée

Le cible de cet étude a été décrire la prédominance de surpoids et obésité chez les étudiants de la région centrale de l'état Rio Grande do Sul, et puis vérifier une possible association entre la classification de l'indice de masse corporale (IMC) et les resultats de l'Aptitude Physique Rapportée á la Santé (AFRS). 1423 étudiants ont été etudiés (54,1% garçons et 45,9% filles), agés entre 7 et 17 ans, venus des écoles de trois villes de Rio Grande do Sul, trouvées à la région centrale. Le surpoids et l'obésité ont été définits à partir de l' IMC pareil ou supérieur à 25 et 30 Kg/m², adaptés pour l'âge et sexe selon la recommendation de *Cole et al* (2000). L'AFRS a été évaluée à partir des essais de 9 minutes. Abdominal et Flexibilité. Pour l'analyse statistique, on a apliqué le test "t" de Student (à fin de vérifier les différences entre les sexes), test Qui-Quadrado (á fin de vérifier des possibles différences entre les prédominances et vérifier l'assiciation parmis les classifications de IMC et résultats de AFRS). La régression lineaire a été utilisée pour vérifier s'il y a de rapport entre l'IMC et l'âge. On a trouvé une prédominance de surpoid(16,8%) et d'obésité (4,6%). Chez les garçons on a trouvé la prédominance de surpoid par rapport les filles (17,9% e 15,5%) et d'obésité (5,7% et 3,3%), en considerant cette différence statistiquement significative ($p<0,05$). Chez les garçons de 10 à 14 ans on a trouvé un percentuel d'individus en surpoid et obésité. La regression lineaire a indiqué qu'il y a des rapports lineaires entre l'IMC et l'âge. On a trouvé d'association entre surpoid/obésité dans les essais de 9 minutes et Abdominal. On peut avoir comme conclusion que la prédominance et surpoid et obésité dans la région où on a fait la recherche est supérieure chez les garçons. La plus grande prédominance de surpoid s'est présentée de 10 à 14 ans. Des enfants en surpoid/obésité présentent une tendence à obtenir des indices inférieur à ceux recommendés dans les tests d'AFRS.

Mots clés: Obésité, Aptitude Physique et Santé.

PREDOMINANCIA DE SOBREPESO Y OBESIDAD EN ESCOLARES DE LA REGIÓN CENTRAL DE RIO GRANDE DO SUL

Resumen

El objetivo de este estudio fue describir la predominancia de sobrepeso y obesidad en escolares de la Región Central de Rio Grande do Sul, (Brasil) y además verificar la posible asociación entre la clasificación de Índice de Masa Corporal (IMC) y de resultados de Aptitud Física Relacionada a la Salud (AFRS). Se estudiaron 1423 alumnos (54,1% de niños y 45,9% de niñas), con edades de 7 a 17 años, pertenecientes a escuelas de tres municipios del interior del Estado de Rio Grande do Sul, situados en la región central. El sobrepeso y la obesidad se definieron a partir del IMC igual o mayor que 25 y 30 kg/m² , adaptados a la edad y sexo de acuerdo con la recomendación de Cole et al (2000). La AFRS se evaluó a partir de las encuestas de 9 minutos, Abdominal y Flexibilidad. Para análisis estadístico, se aplicó el cuestionario "t" de Student (para verificar diferencias entre sexos), cuestionario Qui-Cuadrado (para verificar posibles diferencias entre las predominancias y verificar la asociación entre las clasificaciones del IMC y resultados de la AFRS. La regresión lineal se utilizó para verificar la existencia de relación lineal entre IMC y la edad.. Se encontró una predominancia de sobrepeso y obesidad de 16,8% y 4,6% respectivamente. Los niños presentaron una predominancia superior a la de las niñas en sobrepeso (17,9% y 15,5%) y obesidad (5,7% y 3,3%) respectivamente, siendo esta diferencia estadísticamente significativa ($p<0,05$). El grupo de edad de 10 a 14 años presentó un mayor porcentaje de individuos con sobrepeso y obesidad. La regresión lineal indicó que existe relación lineal entre IMC y la edad. Se encontró asociación entre sobrepeso/obesidad en los cuestionarios de 9 minutos y Abdominal. Se puede concluir que la predominancia de sobrepeso y obesidad en la región investigada es superior en los niños. La mayor predominancia de exceso de peso se presentó entre los 10 y 14 años. Niños con sobrepeso/obesidad presentan tendencia a obtener índices por debajo a lo recomendado en los cuestionarios de AFRS.

Palabras clave: obesidad, Aptitud Física, Salud.

PREVALÊNCIA DE SOBREPESO E OBESIDADE EM ESCOLARES DA REGIÃO CENTRAL DO RIO GRANDE DO SUL

Resumo

O objetivo deste estudo foi descrever a prevalência de sobrepeso e obesidade em escolares da região central do Rio Grande do Sul, além de verificar possível associação entre a classificação do Índice de Massa Corporal (IMC) e escores da Aptidão Física Relacionada a Saúde (AFRS). Foram estudados 1423 alunos (54,1% meninos e 45,9% meninas), com idade entre 7 e 17, anos, de escolas de três municípios do interior do Estado do Rio Grande do Sul, situados na região central. O sobrepeso e obesidade foram definidos a partir do IMC igual ou maior que 25 e 30 kg/m², adaptados para idade e sexo de acordo com a recomendação de Cole *et al* (2000). A AFRS foi avaliada a partir dos testes de 9 minutos, Abdominal e Flexiblidade. Para análise estatística, aplicou-se o teste "t" de Student (para verificar diferença entre sexos), teste Qui-Quadrado (para verificar possíveis diferenças entre as prevalências e verificar associação entre as classificações do IMC e escores da AFRS). A regressão linear foi utilizada para verificar se existe relação linear entre IMC e idade. Encontrou-se uma prevalência de sobrepeso e obesidade de 16,8% e 4,6%, respectivamente. Os meninos apresentaram prevalências superiores as meninas no sobrepeso (17,9% e 15,5%) e obesidade (5,7% e 3,3%) respectivamente, sendo esta diferença estatisticamente significante ($p<0,05$). A faixa etária dos 10 a 14 anos apresentou maior percentual de indivíduos com sobrepeso e obesidade. A regressão linear indicou que existe relação linear entre IMC e idade. Encontrou-se associação entre sobrepeso/obesidade nos testes de 9 minutos e Abdominal. Pode-se concluir que a predominância de sobrepeso e obesidade na região investigada é superior nos meninos. A maior prevalência de excesso de peso apresentou-se dos 10 aos 14 anos. Crianças com sobrepeso/obesidade apresentam tendência a obterem índices abaixo do recomendado nos testes de AFRS.

Palavras chaves: Obesidade, Aptidão Física, Saúde.